FHWA/MDOT/UMTRI Integrated Mobile Observations 2.0 (IMO)

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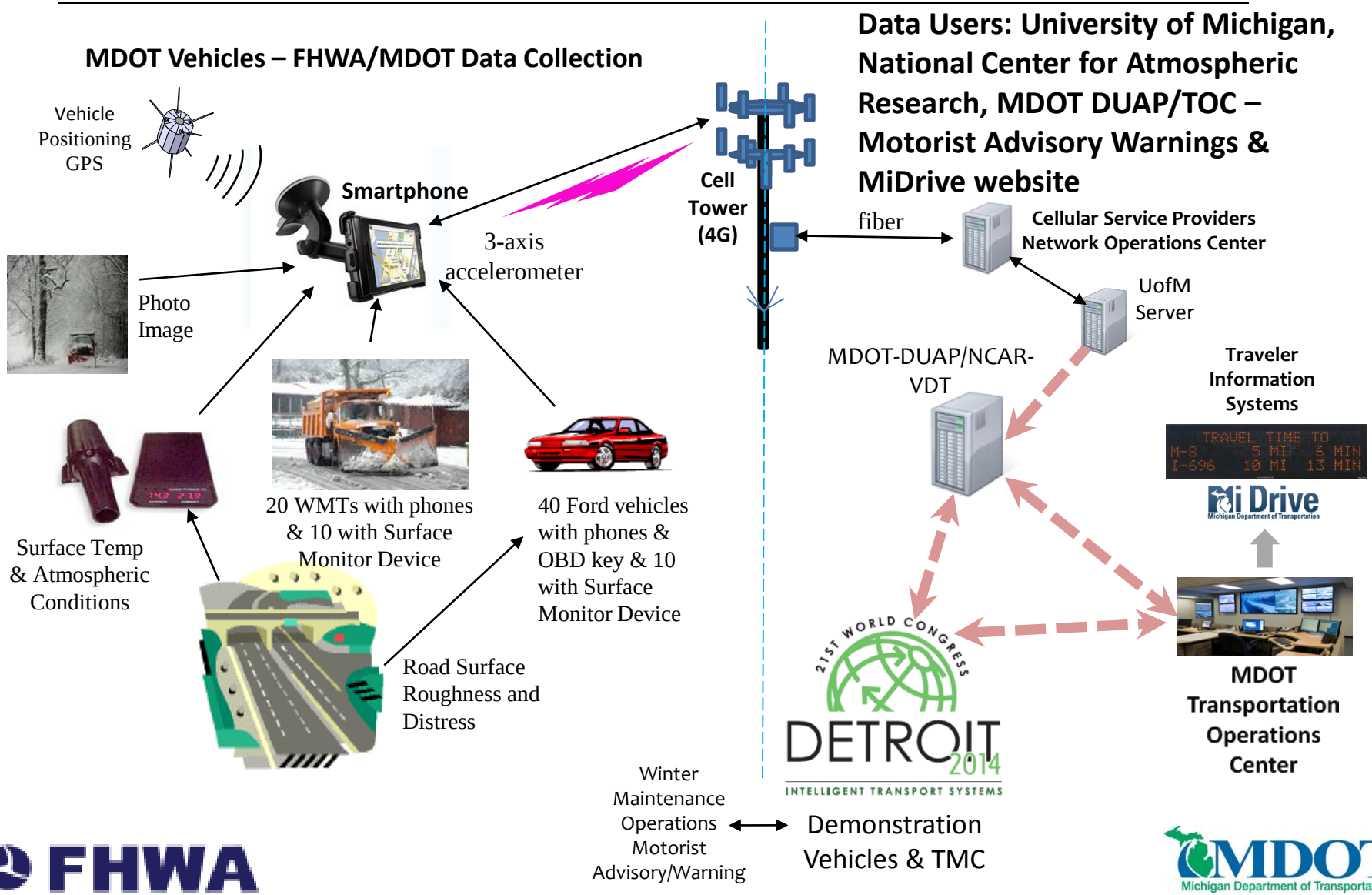
FHWA/MDOT Integrated Mobile Observations (IMO) Architecture



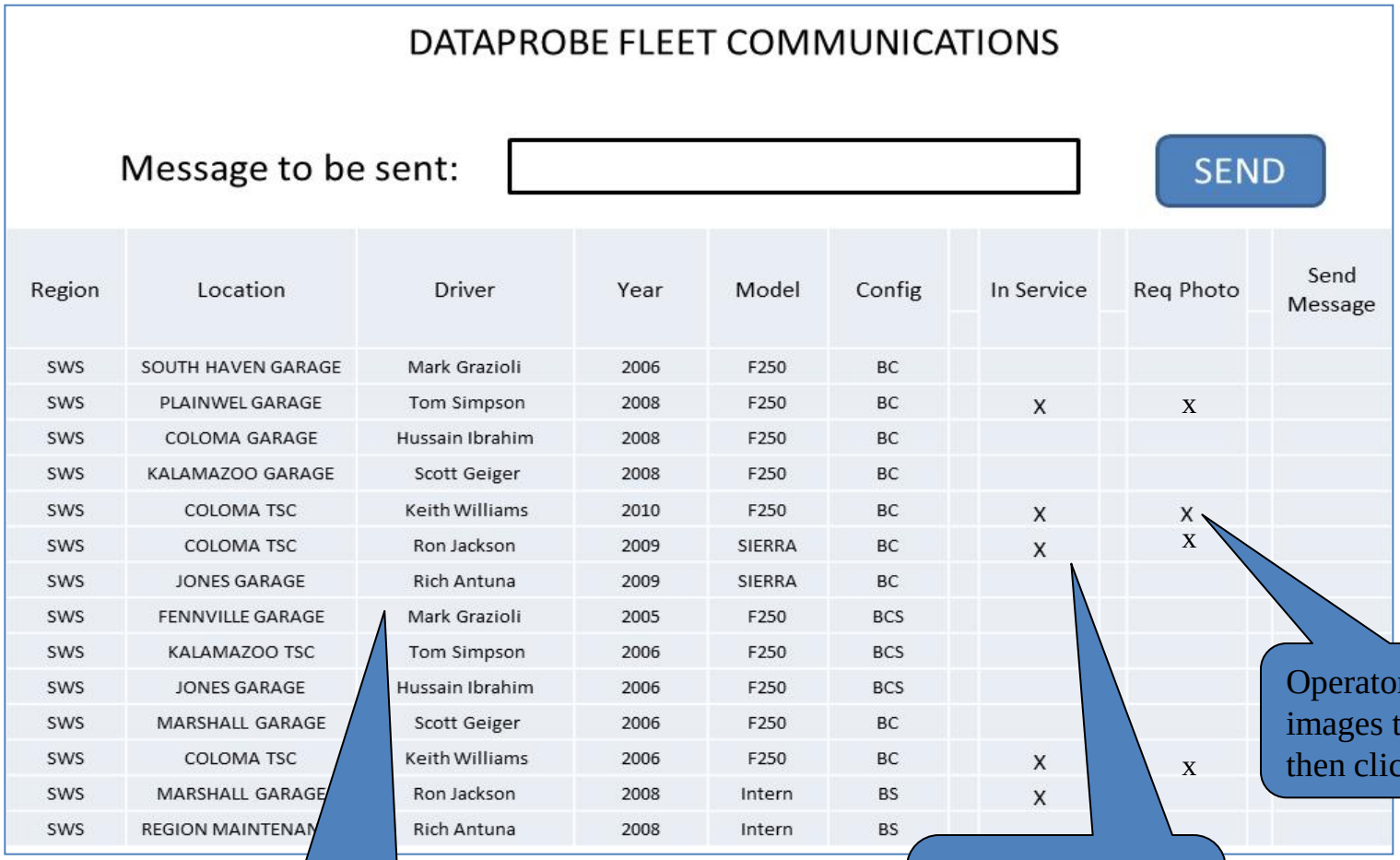
IMO Device Installations

IMO DataProbe Data Sources

SIGNAL	Droid	OBDKey	Surface Patrol
Position	X		
Speed	X		
Direction	X		
Altitude	X		
Distance	X		
Vehicle dynamics	X		
Roughness	X		
Imaging	X		
VIN		X	
RPM		X	
Throttle Position		X	
ABS		X	
Traction Control		X	
Ambient Temp		X	
Barometer		X	
Air & Pavement Temp			X
Humidity			X
Dew Point			X
Number of Vehicles:	(60)	(40)	(20)

Web Portal for Sending IMO Images

**Photo also activated by ABS & traction control event or manually



DATAPROBE FLEET COMMUNICATIONS

Message to be sent:

SEND

Region	Location	Driver	Year	Model	Config	In Service	Req Photo	Send Message
SWS	SOUTH HAVEN GARAGE	Mark Grazioli	2006	F250	BC			
SWS	PLAINWEL GARAGE	Tom Simpson	2008	F250	BC	X	X	
SWS	COLOMA GARAGE	Hussain Ibrahim	2008	F250	BC			
SWS	KALAMAZOO GARAGE	Scott Geiger	2008	F250	BC			
SWS	COLOMA TSC	Keith Williams	2010	F250	BC	X	X	
SWS	COLOMA TSC	Ron Jackson	2009	SIERRA	BC	X	X	
SWS	JONES GARAGE	Rich Antuna	2009	SIERRA	BC			
SWS	FENNVILLE GARAGE	Mark Grazioli	2005	F250	BCS			
SWS	KALAMAZOO TSC	Tom Simpson	2006	F250	BCS			
SWS	JONES GARAGE	Hussain Ibrahim	2006	F250	BCS			
SWS	MARSHALL GARAGE	Scott Geiger	2006	F250	BC			
SWS	COLOMA TSC	Keith Williams	2006	F250	BC	X	x	
SWS	MARSHALL GARAGE	Ron Jackson	2008	Intern	BS	X		
SWS	REGION MAINTENAN	Rich Antuna	2008	Intern	BS			

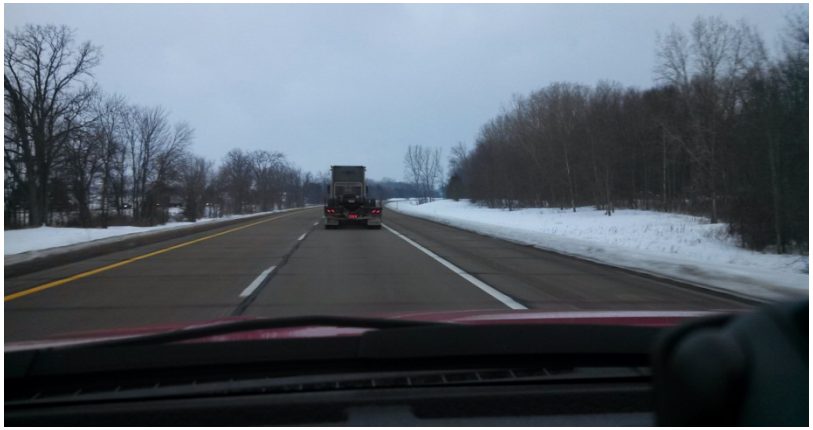
Operator selects images to be taken then clicks SEND

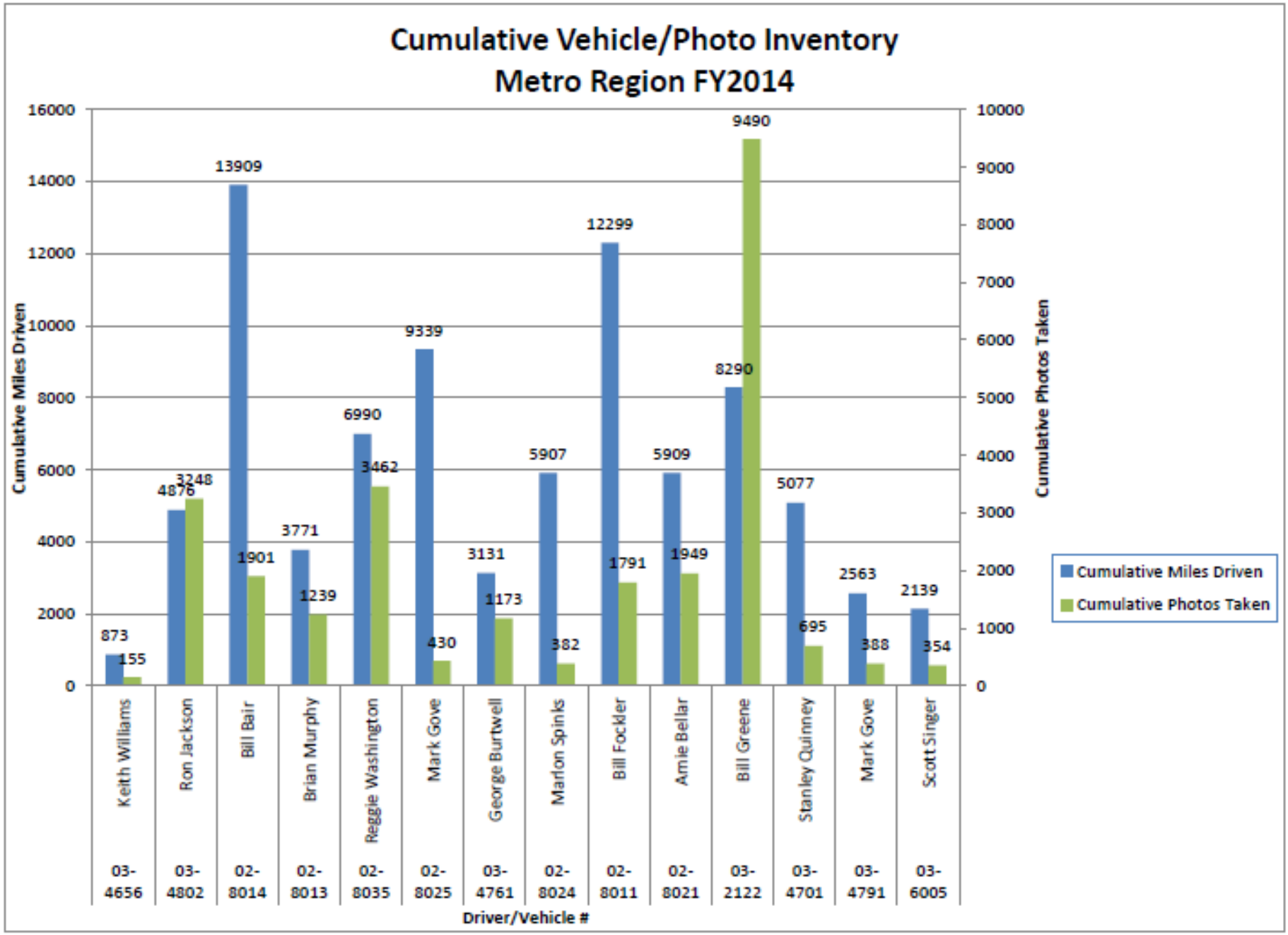
Vehicle fleet details maintained by administrator/operator

Identifies which vehicles are currently in-service

Roadway Camera Images

- Images (jpg files) taken with the Droid camera
- Images triggered by ABS lockup & traction control event, web portal or manually
  - Three image sequence every two seconds
- Images sent to server in five minutes




Cumulative Vehicle/Photo Inventory
Metro Region FY2014
Cumulative Miles Driven
Cumulative Photos Taken
16000
14000
12000
10000
8000
6000
4000
2000
0
10000
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
873
155
4876
3248
13909
1901
3771
1239
6990
3462
9339
430
3131
1173
5907
382
12299
1791
5909
1949
8290
9490
5077
695
2563
388
2139
354
Keith Williams
Ron Jackson
Bill Bair
Brian Murphy
Reggie Washington
Mark Gove
George Burtwell
Marlon Spinks
Bill Fockler
Amie Bellar
Bill Greene
Stanley Quinney
Mark Gove
Scott Singer
03-4656
03-4802
02-8014
02-8013
02-8035
02-8025
03-4761
02-8024
02-8011
02-8021
03-2122
03-4701
03-4791
03-6005
Driver/Vehicle #
Cumulative Miles Driven
Cumulative Photos Taken

IMO Final Report - Lessons Learned (first 17 months)

Vehicles:

- Auto Maker(s) providing the necessary CAN data and technical support
- Tracking vehicles in service is difficult

Hardware:

- Bluetooth serial adapter
- Phone charges can be significant: 60 phones ($37/month/phone) $2,220 per month
- Bluetooth link between the OBD key and DataProbe not consistent/reliable
- Wiring the phone power to the accessory fuse provided “key-on key-off” system

Software:

- Remote phone software update & need internal staff to support development
- Remote software updates require testing and validation

Communication:

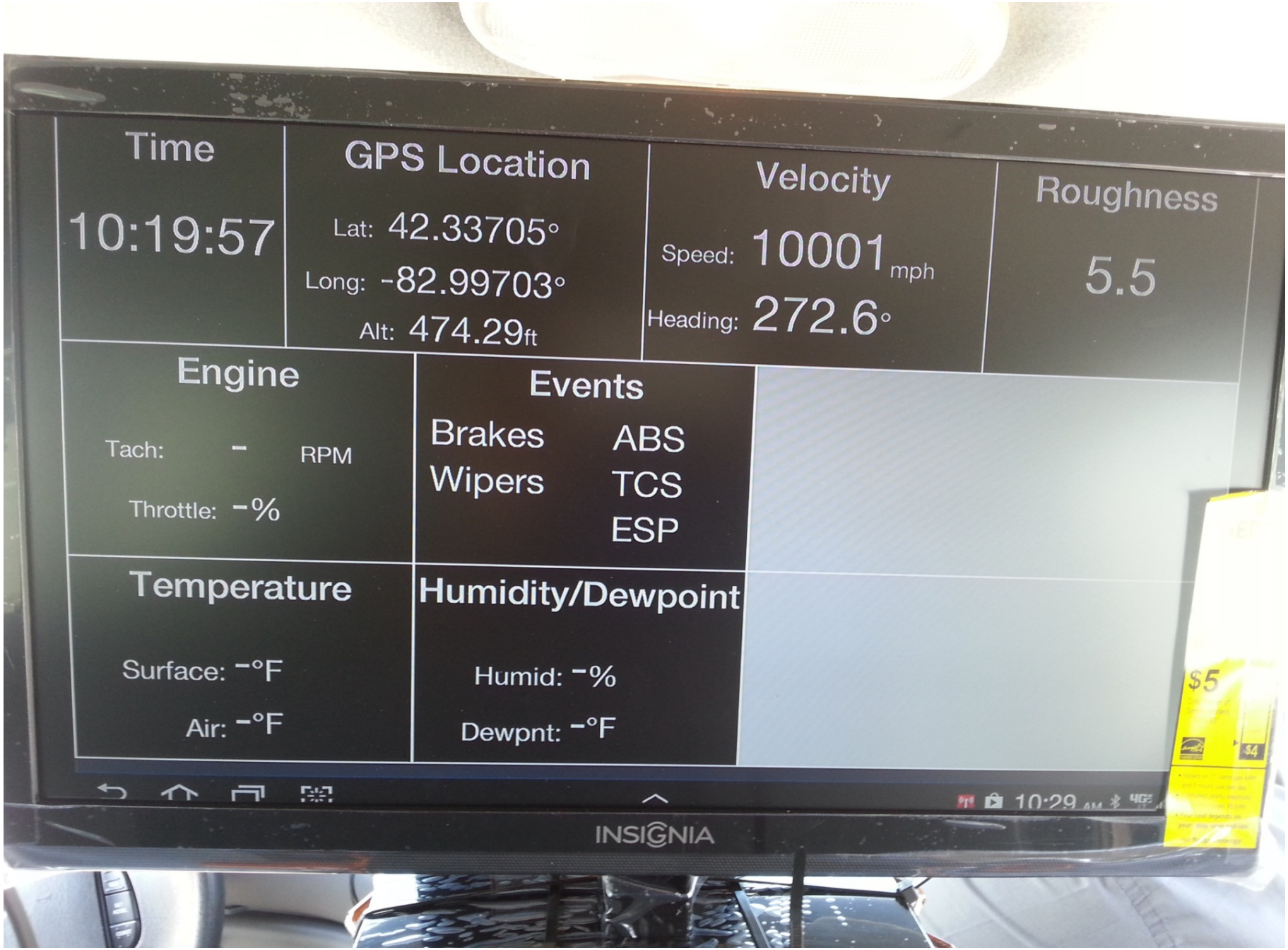
- Survey of drivers brought all the issues up front and helped prioritize work/issues/importance of project
- Comparing weekly miles driven/photos
- Weekly meetings with all stakeholders

IMO Final Report - Conclusions (first 17 months)

- **Delivered 196,204 valid data files to 6 weather analyst organizations throughout the U.S (~5 minute file/may include photos, 172 gigabytes)
- **Drivers drove nearly 400,000 miles and took nearly 45,000 photos
- **Collected all targeted data available on the sensors from vehicle
- Provided data quality check before sending (number of satellites, vehicles idling, etc.)
- Data timeliness: 5 minute to 1minute file uploads – UofM server QC for about 3 minutes (trying to reduce to less than one minute)
- Need more checking from server that data is within a valid range (QC)
- DataProbe system must become more reliable in its interactions with the OBD key and Surface Patrol
- **Automakers technical support for CAN data
- Designed a web portal to take pictures and send message from the portal, and monitor the fleet of IMO vehicles in service (problems with vehicle staying linked to site)
- Need more information about vehicle/sensor functionality while in service
- **Smartphone provides ubiquitous technology, affordable, widely used, etc.
- **Technology provides micro level weather data use and processing
- **Crowd sourcing opportunities with cell phone data collection
- **More vehicles on the road(s) are necessary to reach the critical mass necessary for micro level weather data reporting (what is that critical mass?)
- The OpenXC [open source third party development (lead by Ford)]
- Analyzing photos may open another window for micro level weather reporting (automated process)

IMO World Congress Demonstration - Belle Isle

IMO Demo for WC - Two E350 Ford 10 Passenger Vans


Time
10:19:57
GPS Location
Lat: 42.33705°
Long: -82.99703°
Alt: 474.29ft
Velocity
Speed: 10001 mph
Heading: 272.6°
Roughness
5.5
Engine
Tach: - RPM
Throttle: -%
Events
Brakes ABS
Wipers TCS
ESP
Temperature
Surface: -°F
Air: -°F
Humidity/Dewpoint
Humid: -%
Dewpnt: -°F
10:29 AM
INSIGNIA
$5
$4


GABE

Contact Information

FHWA/MDOT/UMTRI Final IMO Report

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